Following please find MARKED UP VERSIONS OF CLAIMS 2, 3 and 11-13 showing all changes made relative to the previous version of those claims -

2. (Amended) The method according to claim 1, further comprising the step of collimating using a collimator with a collimator slot to prevent the incident radiation [to hit] from hitting the edge of the detector.

3. (Amended) An apparatus for detection of incident radiation [for] in radiographic imaging[, for] applications ranging from about 10 keV to about 50 keV, the apparatus comprising:

an X-ray detector [comprising] able to be oriented relative to the incident radiation, said detector having a plurality of semiconductor X-ray strips arranged on a substrate, said detector being of sufficient height [to cause the dissipation of] such that substantially all of the incident radiation dissipates within said detector,

electrical outputs for each of the strips, and

electrical connections between each of the semiconductor X-ray strips such that the output corresponding to corresponding points in each of the strips is combined,

wherein said X-ray detector is oriented relative to the incident radiation [such that] at an acute angle [is selected] between a direction of said incident radiation and a side of said [strip having] detector of said sufficient height such that incident radiation mainly [hit] hits the side of said detector, said angle being less than ten (10) degrees, and

wherein the area exposed to the incident radiation excludes at least one section of said strip between at least one edge of said detector and at least one active sensor area [and that substantially all of the energy from the incident radiation is dissipated within the detector].

11. (Amended) An apparatus according to claim 3 wherein said detector is able to be oriented such that said incident radiation hits a backside of [the] said detector.

12. (Amended) [Use of an apparatus for detection of incident radiation in scanned-slot medical imaging involving an] An apparatus according to claim 3, wherein the apparatus is used in scanned-slot medical imaging for detection of incident radiation.

13. (Amended) [Use of an apparatus for detection of incident radiation in scanned-slot medical imaging involving an] An apparatus according to claim 12, wherein the use [of] for said medical imaging is selected from the group consisting of mammography, bone densitometry and non-destructive testing.

REMARKS

Claims 1-13 are pending in the application. Claims 1-13 stand rejected. Claims 2, 3 and 11-13 have been amended. Claim 5 has been canceled. No new matter has been introduced by these amendments.

Reply to the Objection to the Drawings

The Examiner has objected to the drawings due to various formalities. Specifically, the Examiner states -

> The drawings must show every feature of the invention specified in the claims. Therefore, the apparatus comprising several deteors [*sic*, detectors], each having a collimator (claim 7) must be shown or the feature(s) canceled from the claim(s).

Attached hereto is proposed new Figure 3 for the Examiner's approval. Support for this proposed Figure is found in paragraph 0028 of the Specification. Accordingly, no new matter is added with this Figure. It is believe that the proposed amendments overcome the objection to the drawings. Withdrawal of the objection to the drawings is respectfully requested.

Reply to the Objection to the Claims

The Examiner has objected to the Claims due to various formalities. Specifically, the Examiner states -

> Claim 2 is objected to because of the following informalities: in line 3, "to hit" should probably be --from hitting--.

Claim 2 has been amended as suggested by the Examiner. It is believe that the proposed amendments overcome the objection to the Claims. Withdrawal of the objection to the Claims is respectfully requested.

Reply to the Rejection of Claims 12 and 13 under 35 U.S.C. § 101

The Examiner has rejected Claims 12 and 13, stating "the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process . . ."

Claims 12 and 13 have been amended. It is believe that the amendments overcome the rejection of Claims 12 and 13 under 35 U.S.C. § 101. Withdrawal of the rejection is respectfully requested.

Reply to the Rejection of Claims 12 and 13 under 35 U.S.C. § 112, second paragraph

The Examiner has rejected Claims 12 and 13 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner states –

> Claims 12 and 13 are rejected because the claims provide for the use of an apparatus for the detection of incident radiation, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claims 12 and 13 have been amended to provide clarity and definiteness. It is believed that these amendments and remarks overcome the rejection of Claims 12 and 13 under 35 U.S.C. § 112, second paragraph. Withdrawal of this rejection, therefore, is respectfully requested.

Reply to the Rejection of Claims 3, 9 and 11 under 35 U.S.C. § 102(b)

The Examiner has rejected Claims 3, 9 and 11 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,937,453 to Nelson ("Nelson"). Specifically, the Examiner states –

> Regarding claim 3, *Nelson* discloses an apparatus **Figs. 1, 6a** for detecting x-rays comprising: an x-ray detector comprising a plurality of semiconductor strips (12; col. 3, line 63-64) arranged on a substrate (10), the detector of sufficient height to cause the dissipation of substantially all of the incident radiation (col. 4, lines 12-16), and electrical outputs (12) for each of the strips; and electrical connections (18) between the strips such that the electrical output corresponding to corresponding points in each of the strips is combined.
>
> Regarding the orientation of the detector relative to the incoming radiation and the area actually exposed to the radiation, it is noted that such functional limitations do not limit the structure of the claimed apparatus . . .
>
> Regarding claim 9, *Nelson* discloses that detector is made of silicon (col. 3, line 58).

> Regarding claim 11, the orientation of the detector relative to the incoming radiation, it is noted that such functional limitation does not limit the structure of the claimed apparatus . . .

For the following reasons, Applicants respectfully traverse the Examiner's rejection of Claims 3, 9 and 11 as being anticipated by Nelson.

Nelson was previously discussed in paragraph 0005 of the 'Background of Invention' section of the present Specification. The detector of Nelson includes a conventional silicon type strip detector having a plurality of parallel elongated aluminum strips 12 deposited on one surface of the silicon substrate 10 (col. 3, lines 56-61). Electrical connections 18 are provided from the aluminum strips 12 to an amplifier 20 (col. 3, lines 66-68). The detector has a thickness T, height H and length L (col. 4, lines 3-4).

Those figures found in Nelson illustrate various applications of the Nelson invention. As mentioned in Specification of the present application, Nelson discloses in Figure 1 a silicon x-ray detector that is oriented edge-on to the incident beam. Since silicon micro-strip detectors are produced on thin (*i.e.*, several hundred microns) wafers, they are used in an edge-on geometry wherein photons hit the detector from the side or face 11 and are absorbed the length of the strip (col. 4, lines 7-12). For this edge-on orientation illustrated in Figure 1, the height H of the detector is chosen such that substantially all of the energy of the incident collimated x-rays 22 is discharge while passing through the length L of the detector (col. 4, lines 12-15).

Figures 4, 5 and 6a illustrate use of the Nelson invention in slit scanning applications. In this application, an x-ray slit collimator 42 is laid over the detector and moves along the surface of the detector that the strips 12 are found on (col. 6, lines 15-19; *see also*, Figures 4, 5 and 6a). The detector remains stationary in this application (col. 6, line 15; col. 7, lines 5-7).

Independent Claim 3 has been amended to add structural language to the definition of the detector, defining it as a movable detector or one that can be oriented relative to the incident radiation. As shown above, Nelson specifically states that its detector is stationary. It is well recognized that in order for a reference to anticipate an invention, the reference must teach each and every element as claimed. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ...

claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). As Nelson does not teach or suggest a movable detector, Nelson cannot be said to anticipate the presently claimed invention.

It is believed that these remarks overcome the rejection of Claims 3, 9 and 11 under 35 U.S.C. § 102(b). Withdrawal of this rejection, therefore, is respectfully requested.

Reply to the Rejection of Claim 10 under 35 U.S.C. § 103(a)

The Examiner has rejected Claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Nelson. Specifically, the Examiner states –

> Regarding claim 10, *Nelson* discloses that the detector may utilize different materials (col. 6, lines 62-64). Particular materials such as gallium arsenide and CdZnTe are well known for use in radiation detectors and would have been an obvious design choice.

For the following reasons, Applicants respectfully traverse the Examiner's rejection of Claim 10 as being unpatentable over Nelson.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending there from is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). As shown above, Nelson does not teach or suggest a detector that can be orientated relative to the incident radiation. As Claim 10 depends from Claim 3 it, too, includes this limitation and is therefore nonobvious.

It is believed that these remarks overcome the rejection of Claim 10 under 35 U.S.C. § 103(a). Withdrawal of this rejection, therefore, is respectfully requested.

Reply to the Rejection of Claims 1, 2, 4, 6 and 7 under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 1, 2, 4, 6 and 7 under 35 U.S.C. § 103(a) as being unpatentable over Nelson in view of U.S. Patent No. 5,227,635 to Iwanczyk ("Iwanczyk"). Specifically, the Examiner states –

Regarding claim 1, *Nelson* and *Iwanczyk* (see explanation regarding claims 4 and 6 below) suggest a method of obtaining improved radiographic images comprising the steps of: orienting a semiconductor radiation detector having a height greater than its thickness (see generically Figs. 1 and 6A), the detector comprising a substrate (10) and pixel sensors formed as strips (12); wherein the orientation step includes selecting an acute angle between a direction of the incident radiation such that the incident radiation mainly hits the side of the detector (col. 7, lines 7-11); and excluding at least one section of the hit area between at least one edge of the detector and at least one active sensor (i.e., the area covered by the collimator (21) as suggested by *Iwanczyk*), wherein substantially all of the radiation is dissipated within the detector (col. 4, lines 12-16).

Although *Nelson* does not disclose the particular angle as being selected to be less than about 10 degrees, absent some degree of criticality, it would have been a matter of obvious design choice within the skill of a person of routine to choose the optimum angle depending on the needs of the particular application.

Regarding claim 2, in the method suggest by *Nelson* and *Iwanczyk*, *Iwanczyk* suggests a step of collimating using a collimator with a slot (21) to prevent incident radiation from hitting the edge of the detector.

Regarding claim 4, *Nelson* does not disclose the detector includes a guard ring to sink leakage current.

Regarding the use of a guard ring, *Iwanczyk* discloses an x-ray detector (10) including a guard ring (15) to sink leakage current (col. 1, lines 41-51). *Iwanczyk* teaches that the use of a guard ring allows for improved energy detector performance (col. 1, lines 52-54). As such it would have been obvious to a person of ordinary skill in the art to modify the device disclosed by *Nelson* to include a guard ring so as to allow for improved detector performance.

Regarding claim 6, in the device suggested by *Nelson* and *Iwanczyk* (see explanation regarding claim 4 above), *Iwanczyk* further discloses the use of a collimator (21) having a collimator slot for preventing the incident radiation from hitting the edge of the detector (col. 2, lines 38-51).

Regarding claim 7, *Nelson* discloses that several detectors may be used in order to increase the size of the detector (see generally Figs. 3, 5; and col. 6, lines 33-34).

For the following reasons, Applicants respectfully traverse the Examiner's rejection of Claims 1, 2, 4, 6 and 7 as being unpatentable over Nelson in view of Iwanczyk.

Nelson was discussed above, those arguments being incorporated herein. As shown, Nelson teaches placing a detector so that it is radiated on its edge (Figure 1 of Nelson) or on its face containing the strips 12 (Figure 6a of Nelson). Regarding the Examiner's statement that "[a]lthough *Nelson* does not disclose the particular angle as being selected to be less than about

10 degrees, absent some degree of criticality, it would have been a matter of obvious design choice. . . to choose the optimum angle", Applicants strongly disagree. It is well known in the art that silicon microstrip detectors such as taught by Nelson are produced on thin (*i.e.*, only several hundred microns thick) wafers. Because they are thin, an "edge-on" geometry is employed where the photons hit the detector from the side and are absorbed along the whole length of the strip. As is clearly stated by Nelson, "[i]n this way the x-ray stopping power of the detector is increased" (col. 4, lines 15-16). In slit scanning applications, the x-ray is applied through the slit collimator 42 to the face of the detector where the strips 12 are found, with the collimator 42 moving along the surface of the detector (Figure 6a; col. 6, lines 18-19), a ninety degree change in the direction of the application of the radiation. For this reason, one skilled in the art would only be motivated to apply the radiation edge-on, or directly to the face of the detector where the strips are found.

As taught by the present invention, by moving the detector so that incident radiation hits the face of the detector at an angle of 10 degrees or less, detection efficiency is maximized (see, *e.g.*, paragraph 0024 of the present Specification). Nowhere is there to be found any suggestion or teaching in the cited art that would provide one skilled in the art to tilt the detector at such an angle. Instead, Nelson teaches a stationary detector, thereby teaching away from such movement or orientation of the detector.

Referring to Iwanczyk, therein is disclosed a mercuric iodide x-ray detector 10. The detector 10 includes an entrance electrode 17, an entrance surface 18, a backside surface 13 (of the entrance electrode 17), a collection electrode 12, a disc-shaped body 11 of Mercuric Iodide, a shield 21 overlying the entrance electrode 17, and a guard ring 15 (col. 2, lines 14-38). Iwanczyk provides no teaching or suggestion as to the orientation of the detector with respect to incident radiation, as is claimed in Independent Claims 1 and 3 and therefore their dependent claims. Further, Iwanczyk does not teach or suggest an angle of orientation of 10 degrees or less. Accordingly, Iwanczyk adds nothing to Nelson; Nelson, alone or in combination with Iwanczyk, does not teach or suggest the presently claimed invention.

It is believed that these remarks overcome the rejection of Claims 1, 2, 4, 6 and 7 under 35 U.S.C. § 103(a). Withdrawal of this rejection, therefore, is respectfully requested.

Reply to the Rejection of Claim 5 under 35 U.S.C. § 103(a)

The Examiner has rejected Claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Nelson in view of U. S. Patent No. 5,434,417 to Nygren ("Nygren"). Specifically, the Examiner states –

> Regarding claim 5, although *Nelson* does not disclose the particular thickness of the detector, it is known in the art to arrange such detectors such that the thickness is between 0.1 mm and 1.0 mm (see for example *Nygren* disclosing an improved strip detector with a thickness of 0.3 -- col. 4, lines 15-17). As such, absent some degree of criticality, the choice of a thickness between 0.1 and 1.0 mm is viewed as an obvious design choice within the skill of a person of ordinary skill in the art depending on the needs of the particular application.

Claim 5 has been canceled. Accordingly, the rejection of Claim 5 is now moot.

Reply to the Rejection of Claim 8 under 35 U.S.C. § 103(a)

The Examiner has rejected Claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Nelson and Iwanczyk as applied to Claim 7 above, and further in view of German Patent No. DE 196 18 465 to Jahnke ("Jahnke"). Specifically, the Examiner states –

> Regarding claim 8, regarding the use on an absorber placed between detectors, it is well known in the art (see for example *Jahnke*) to include the use of an absorber (3) placed between adjacent detectors (1). Those skilled in the art appreciate that the use of such absorbers allow for better system performance by reducing cross-talk and scattered radiation between detectors. As such it would have been obvious to a person of ordinary skill in the art to modify the device disclosed by *Nelson* and *Iwanczyk* to include absorbers in order to improve system performance.

For the following reasons, Applicants respectfully traverse the Examiner's rejection of Claim 8 as being unpatentable over Nelson and Iwanczyk as applied to Claim 7, and further in view of Jahnke.

Nelson and Iwanczyk were discussed above, those arguments being incorporated herein. As discussed, neither Nelson nor Iwanczyk teach or suggest a detector that is movable and can therefore be orientated relative to the incident radiation. Jahnke, like Nelson, is discussed in the 'Background of Invention' section of the present Specification. As indicated, Jahnke teaches an edge-on geometry of the detectors (similar to Figure 1 of Nelson). Jahnke does not teach or suggest moving the detectors to an angle of 10 degrees or less relative to the incident radiation.

As Claim 8 depends from Claim 3, Claim 8 includes this limitation and therefore is patentable over Nelson, Iwanczyk and Jahnke, alone or in combination.

It is believed that these remarks overcome the rejection of Claim 8 under 35 U.S.C. § 103(a). Withdrawal of this rejection, therefore, is respectfully requested.

It is believed that the above amendments and remarks overcome the Examiner's objections and rejections of the claims under 35 U.S.C. §§ 112, second paragraph, 101, 102(b) and 103(a) as indicated herein above. Withdrawal of the objections and rejections is therefore respectfully requested. Allowance of the claims is believed to be in order, and such allowance is respectfully requested.

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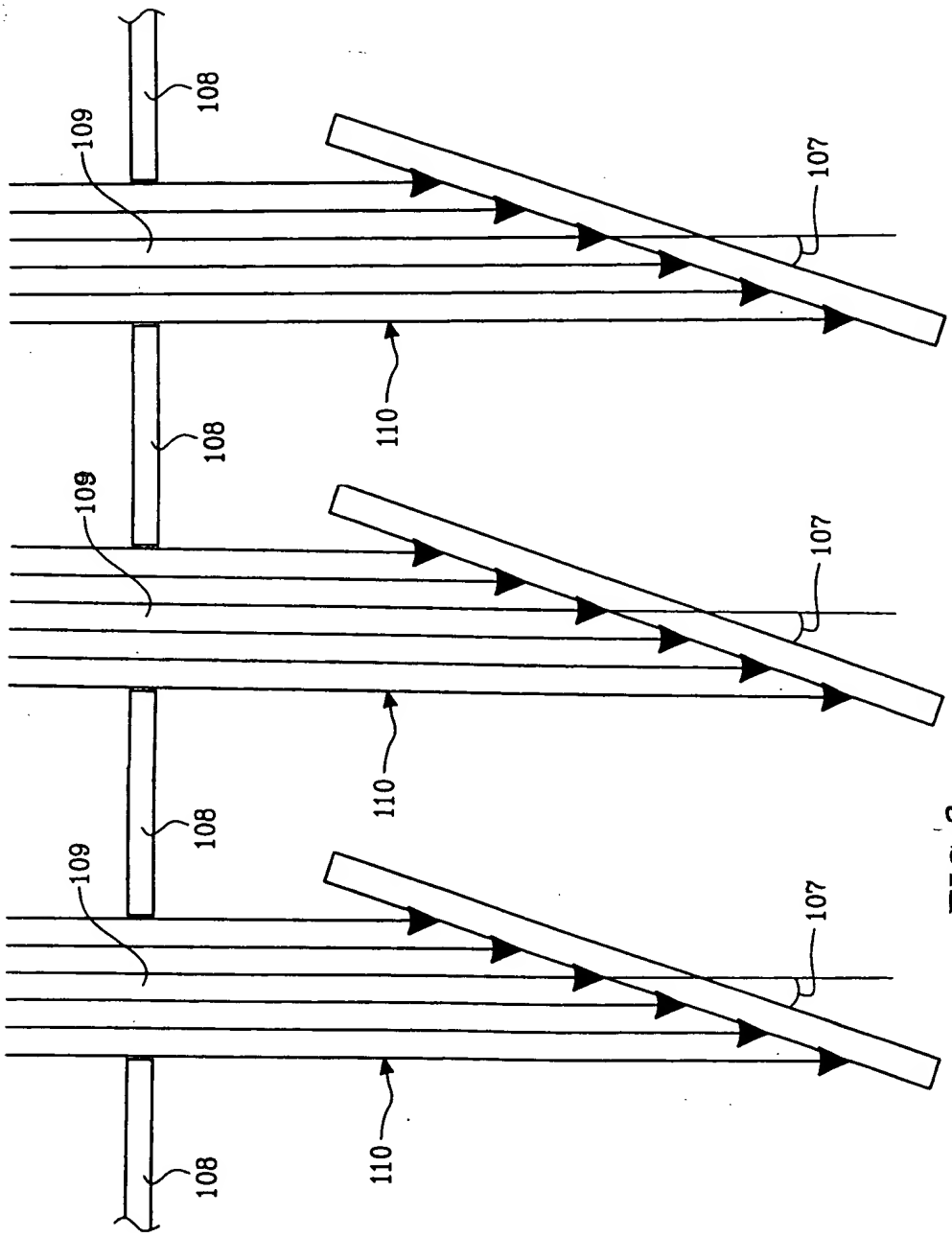

FIG.3